V. "A simple Mode of Demonstrating how the Form of the Thorax is partly determined by Gravitation." By T. P. ANDERSON STUART, M.D., Professor of Physiology in the University of Sydney, N.S.W. Communicated by Professor SCHÄFER, F.R.S. Received January 12, 1891.

It is a well-known fact that the quadrupeds have the transverse section of the thorax elliptical with the long axis vertical. This form of thorax, more or less, is possessed also by the human fœtus. As the erect posture is gradually assumed in the development of species and of the human individual the ventro-dorsal and transverse diameters approximate to each other, and then, the process continuing, in the adult the transverse diameter exceeds the antero-posterior.

That these are the forms proper to the thorax when under the influence of gravitation alone is seen by holding a hoop made of a strip of ordinary crinoline steel $\frac{1}{2}$ inch wide and about 6 feet long, so that its plane is vertical; its form is that of an ellipse. Now grasp the hoop firmly between the fore-finger and thumb of one hand, and gradually turn the internal face of the portion grasped till it looks straight forwards. The front part of the hoop will, of course, be lower, corresponding in some measure to the slope of the ribs, &c. At the same time the diameters approximate to each other. Continue the turning till the face that looked straight forwards looks upwards and forwards, so that in fact the plane of the grasped portion corresponds to that in which the lower dorsal region of the vertebral column of man lies. The slope of the ribs is lessened, but the interesting points are that the transverse diameter exceeds the antero-posterior, and the exact curve and direction of the surface of the lower ribs are reproduced. Then are seen the twist in the long axis of the rib and likewise that great hollow on each side of the vertebral column which is so marked a feature in the human thorax.

I do not overlook the fact that the conditions in the organism are not just the same as they are in this simple hoop; but I think it will be conceded that where there is a force so constant and so potent in its action as is that of gravitation it will be yielded to by the organism unless there be some good reason to the contrary. Now there does not seem to me to be any such reason here, and it is interesting to observe how closely the thorax of the animal follows the lines of the hoop of steel when the conditions as to gravitation are the same.

I am thus led to suspect that gravitation has had a larger share than is usually thought in moulding the form of the vertebrate thorax both in health and disease.

Any strip of elastic material will do for the above if the length be suitable—one readily finds the proper length by trying larger and smaller circles.

VI. "On the Physiology of Asphyxia, and on the Anæsthetic Action of Pure Nitrogen." By GEORGE JOHNSON, M.D., F.R.S. Received January 26, 1891.

(Abstract.)

The main object of this paper is to bring forward additional evidence in support of the theory that the immediate cause of death in cases of asphyxia is the arrest of the pulmonary circulation. I have to express my obligation to my friend Mr. Charles James Martin, M.B., B.Sc., Demonstrator of Physiology in King's College, for the time and labour which, by my request, he has bestowed in the performance of numerous and various experiments, the results of which will, I think, throw much light upon the complex phenomena of asphyxia. It is right to mention that Mr. Martin is not responsible for my interpretation of the results of his experiments.

All the experiments were performed on animals under the influence of anæsthetics, and every animal was finally killed by deprivation of air.

Animals—rabbits, cats, and, in a few cases, dogs—were asphyxiated either by ligature of the trachea, by the paralysing influence of curara, or by causing them to inhale a gas containing no free oxygen, viz., nitrous oxide, pure nitrogen, hydrogen, and carbonic acid gas. In all these experiments, re-inspiration of the gases was avoided by allowing the expired gas to escape through a T-tube fixed in the trachea.

During the performance of the experiments, in most cases, the chest and pericardium of the animals were opened so that the relative fulness of the cavities might be readily observed. In all the experiments, the results, as regards distension of the heart's cavities, were essentially the same, no matter whether the air was simply excluded or whether an azotic gas (*i.e.*, a gas, not in itself poisonous, but unable to support life) was substituted for atmospheric air; the only difference being that when an azotic gas is inhaled the phenomena are far more rapidly produced, in consequence of the more speedy displacement of oxygen from the lungs.

The principal changes in the heart's cavities were, first, distension of the left cavities; second, enormous distension of the right cavities with diminished distension of the left, the circulation being apparently arrested by the inability of the right cavities to empty themselves, in